

REMARKS

These remarks are responsive to the Final Office Action mailed August 18, 2011. It is respectfully submitted that the claims contain limitations that patentably define over the references cited in that Office Action, for the reasons discussed in these remarks. Therefore, reconsideration and allowance of the pending claims is appropriate and respectfully requested.

Independent Claims 1 and 9

The Final Office Action maintains the rejections of independent claims 1 and 9 under 35 U.S.C. § 102(b) as anticipated by an article published by Ko et al., "Chest CT: Automated Nodule Detection and Assessment of Change Over Time - Preliminary Experience", Radiology, 218 : 267-273 (2001) (hereafter "Ko"). Reconsideration of the rejections of claims 1 and 9 as anticipated by Ko is respectfully requested.

Those two claims respectively recite registration of "only those image areas associated with object constituents which are relevant to the predetermined task", and "registration only of the image areas associated with object constituents relevant to the predetermined task" (emphasis added). Thus, in order to anticipate claims 1 and 9, Ko needs to disclose that particular claimed subject matter. It is important that both claims require a "registration" of "only" the object constituents which are "relevant" to a predetermined task. The interplay between those three requirements distinguishes the claims from the disclosure of Ko. It is respectfully submitted that the rejections in the Final Office Action do not take into account each one of those claim limitations.

First considering the registration requirement, the registration in Ko includes several object constituents. The registered object constituents include at the very least the sternum, the vertebra, the trachea, and the lungs. This is established by the disclosure in Ko reproduced here:

Analysis of change over time.—Identification of corresponding nodules on separate studies was more challenging than was identification of corresponding nodules on consecutive images in the same study. Differences in patient position and inspiration complicated **registration** between two different CT studies.

For each image in a patient's initial CT study, the computer identified a possible matching image and two surrounding images in the follow-up CT study. **This was performed with use of centroids of anatomic structures such as the sternum, vertebra, and trachea (Fig 3).**

By aligning anatomic centroids, differences in translation and rotation could be addressed. The centroid of the trachea was used because the trachea is typically a midline structure. However, the trachea can be shifted secondary to atelectasis or an adjacent mass and may not be a consistent landmark for registration. **The most medial, lateral, anterior, and posterior pixels of each lung were also identified and registered as were the centroids of the individual and combined lungs.** Results of **global registration** were used to quantify the translational and rotational differences between images. Given the centroid of a nodule in one image, a projected centroid of the same nodule in an image from a subsequent study was calculated with the translational and rotational parameters generated from the **global registration of thoracic structures**. A fixed area of 10^2 pixels around this projected centroid was searched to locate the centroid of the corresponding nodule. The initial study was similarly searched to identify nodules that corresponded with nodules identified on the follow-up study. The sizes of corresponding nodules in the two studies were then compared.

See Ko, at page 270, columns 1-2 (bolded emphasis added). Thus, in Ko, the registered object constituents include the sternum, the vertebra, the trachea, and the lungs.

Therefore, if claims 1 and 9 are properly anticipated by Ko, then the sternum, the vertebra, the trachea, and the lungs must be the only object constituents which are relevant to the predetermined task. As the limitations in claims 1 and 9 apply to Ko, the predetermined task is trend control of lung tumors by identifying lung nodules. It follows, in order for Ko to anticipate claims 1 and 9, that the sternum, the vertebra, the trachea, and the lungs must be the only object constituents which are relevant to trend control of lung tumors by identifying lung nodules.

The Final Office Action concludes Ko anticipates claims 1 and 9 because the sternum, the vertebra, the trachea, and the lungs are used to spatially register two thoracic CT studies of the same patient recorded at different times in order to perform trend control of lung tumors by identifying lung nodules. See Office Action of August 18, 2011, at 2-5. The applicants agree that Ko factually discloses using the sternum, the vertebra, the trachea, and the lungs to spatially register two thoracic CT studies of the same patient recorded at different times in order to perform trend control of lung tumors by identifying lung nodules. However, the applicants disagree with the conclusion that such

a disclosure satisfies the claim limitation requiring registration of only object constituents which are relevant to the predetermined task.¹

According to the Final Office Action, use of *any* object constituent (for example sternum, vertebra, trachea, or lung) as part of a registration during the course of performing trend control of lung tumors by identifying lung nodules makes that object constituent “relevant” to such trend control. But that conclusion is directly contrary to the language of claims 1 and 9, which both require registration of only object constituents which are relevant to trend control of lung tumors by identifying lung nodules.

It is clear from the language of claims 1 and 9 that some object constituents are relevant to the predetermined task, while other object constituents are not relevant to the predetermined task. It is further clear from the claim language that it is only the relevant objects which are registered — that is, non-relevant object constituents are not registered. Such relevancy, or lack thereof, is determined in reference to the predetermined task. See Application, at page 2, lines 16-26. If the object constituent is relevant to the predetermined task, then it is registered. If the object constituent is not relevant to the predetermined task, then it is not registered. That is the plain and ordinary meaning of the claim limitations reciting registration of only object constituents which are relevant to the predetermined task. Thus, the Final Office Action in effect puts the cart before the horse in concluding that registration determines relevancy. The claims recite the exact opposite: relevancy determines registration. The Final Office Action’s reasoning ignores the claim terms “only” and “relevant”, in effect reading them out of the claim.

A proper application of the limitations in claims 1 and 9 to the disclosure of Ko, therefore, starts with identifying the claimed predetermined task. In Ko, that task is trend control of lung tumors by identifying lung nodules. Next, the object constituents which are relevant to that predetermined task are identified. The specification of the present application makes clear that the object constituents which are relevant to trend control of lung tumors by identifying lung nodules are the patient’s lungs, and the detected nodules within the lungs. See Application, at Abstract; at page 2, lines 16-20 (“In the trend control of lung tumors, for instance, the lungs are the relevant

¹ In this respect, the statement in the Final Office Action that “based on the applicant’s definition provided by the remarks, registration of the trachea is considered relevant, meeting the limitations of the claim as recited” is wrong. Those remarks, in fact, indicate the trachea is not relevant.

object constituents.”); and at page 5, line 11 to page 6, line 10 (“In the trend control of lung tumors, the only relevant object constituents are the lungs”). Other object constituents, such as the sternum, vertebra, and trachea, are not relevant to control of lung tumors by identifying lung nodules — even if they are used for image registration while performing that task. They are not relevant to the task because they do not affect the location or size of lung nodules. They are, in fact, outside of the lungs. The sole object constituent relevant to identifying and tracking lung nodules are the lungs themselves. The benefit to the claimed invention — i.e. limiting registration to only relevant objects — is avoiding the time and work required by the Ko process to register non-relevant objects such as the sternum, vertebra, and trachea. See Application, at page 2, lines 19-26; page 3, lines 3-11; and page 5, line 11 to page 6, line 10.

For at least these reasons, Ko fails to disclose each and every limitation of claims 1 and 9, and the rejection of those claims as being anticipated by Ko should be reconsidered and withdrawn.

Independent Claim 18

The Office Action also rejects independent claim 18 in the application under 35 U.S.C. § 102(b) as anticipated by Ko. Reconsideration of this rejection is respectfully requested. Claim 18 recites a method for a user to select one or more object constituents to be registered, with the selected object constituents being relevant to a predetermined task, such that only the selected object constituents are registered. Thus, the reasons already provided above for why claims 1 and 9 are not anticipated by Ko apply equally well to claim 18. For at least those same reasons, Ko fails to disclose each and every limitation of claim 18 and the rejection of that claim as being anticipated by Ko should be reconsidered and withdrawn.

Independent Claim 20

The Office Action also rejects independent claim 20 in the application under 35 U.S.C. § 102(b) as anticipated by Ko. Reconsideration of this rejection is respectfully requested.

Claim 20 recites “registration only of the image areas associated with object constituents which are required to perform the predetermined task.” Thus, in order to anticipate claim 20, Ko needs to disclose that particular claimed subject matter. It is important that claim 20 requires a

“registration” of “only” the object constituents which are “required to perform” a predetermined task. The interplay between those three requirements distinguishes claim 20 from the disclosure of Ko. It is respectfully submitted that the rejection in the Final Office Action does not take into account each one of those claim limitations.

First considering the registration requirement, as already discussed above, the registered object constituents in Ko include the sternum, the vertebra, the trachea, and the lungs. See Ko, at page 270, columns 1-2.

Therefore, if claim 20 is properly anticipated by Ko, then the sternum, the vertebra, the trachea, and the lungs must be the only object constituents which are required to perform the predetermined task. As the limitations in claim 20 apply to Ko, the predetermined task is trend control of lung tumors by identifying lung nodules. It follows, in order for Ko to anticipate claim 20, that the sternum, the vertebra, the trachea, and the lungs must be the only object constituents which are required to perform trend control of lung tumors by identifying lung nodules.

The Final Office Action concludes Ko anticipates claim 20 because the sternum, the vertebra, the trachea, and the lungs are used to spatially register two thoracic CT studies of the same patient recorded at different times in order to perform trend control of lung tumors by identifying lung nodules. See Office Action of August 18, 2011, at 6-7. The applicants agree that Ko factually discloses using the sternum, the vertebra, the trachea, and the lungs to spatially register two thoracic CT studies of the same patient recorded at different times in order to perform trend control of lung tumors by identifying lung nodules. However, the applicants disagree with the conclusion that such a disclosure satisfies the claim limitation requiring registration of only object constituents which are required to perform the predetermined task.

According to the Final Office Action, use of *any* object constituent (for example sternum, vertebra, trachea, or lung) as part of a registration during the course of performing trend control of lung tumors by identifying lung nodules makes that object constituent “required to perform” such trend control. But that conclusion is directly contrary to the language of claim 20, which requires registration of only object constituents which are required to perform trend control of lung tumors by identifying lung nodules.

It is clear from the language of claim 20 that some object constituents are required to perform the predetermined task, while other object constituents are not required to perform the predetermined task. It is further clear from the claim language that it is only the required objects which are registered — that is, non-required object constituents are not registered. Such requirement, or lack thereof, is determined in reference to the predetermined task. See Application, at page 2, lines 16-26. If the object constituent is required to perform the predetermined task, then it is registered. If the object constituent is not required to perform the predetermined task, then it is not registered. That is the plain and ordinary meaning of the claim limitations reciting registration of only object constituents which are required to perform the predetermined task. Thus, the Final Office Action in effect puts the cart before the horse in concluding that registration determines requirement. Claim 20 recites the exact opposite: requirement determines registration. The Final Office Action's reasoning ignores the claim terms "only" and "required to perform", in effect reading them out of the claim.

A proper application of the limitations in claim 20 to the disclosure of Ko, therefore, starts with identifying the claimed predetermined task. In Ko, that task is trend control of lung tumors by identifying lung nodules. Next, the object constituents which are required to perform that predetermined task are identified. The specification of the present application makes clear that the object constituents which are required to perform trend control of lung tumors by identifying lung nodules are the patient's lungs, and the detected nodules within the lungs. See Application, at Abstract; at page 2, lines 16-20 ("In the trend control of lung tumors, for instance, the lungs are the relevant object constituents."); and at page 5, line 11 to page 6, line 10 ("In the trend control of lung tumors, the only relevant object constituents are the lungs"). Other object constituents, such as the sternum, vertebra, and trachea, are not required to perform control of lung tumors by identifying lung nodules — even if they are used for image registration while performing that task. They are not required for the task because they do not affect the location or size of lung nodules. They are, in fact, located outside of the lungs. The sole object constituent required to identify and track lung nodules are the lungs themselves. The benefit to the claimed invention — i.e. limiting registration to only required objects — is avoiding the time and work required by the Ko process to register non-required objects such as the sternum, vertebra, and trachea. See Application, at page 2, lines 19-26; page 3, lines 3-11; and page 5, line 11 to page 6, line 10.

For at least these reasons, Ko fails to disclose each and every limitation of claim 20 and the rejection of that claim as being anticipated by Ko should be reconsidered and withdrawn.

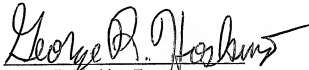
Dependent Claims 2-8, 10-17 and 19

Claims 2-8, 10-17 and 19 each ultimately depend from parent independent claim 1, parent independent claim 9 or parent independent claim 18. The Office Action rejects each of these dependent claims under 35 U.S.C. § 103(a) as being unpatentable over Ko (discussed above in connection with the parent independent claims) in view of one other companion reference. In each rejection, Ko was relied upon as teaching the limitations of the parent independent claim, and the companion reference was cited as teaching the limitations of the dependent claim(s). For at least the reasons identified above, however, Ko does not anticipate claim 1, 9 or 18. On that same basis, it is respectfully submitted that the corresponding obviousness rejections of the dependent claims should be reconsidered and withdrawn.

Conclusion

These remarks are fully responsive to the Final Office Action mailed August 18, 2011. It is respectfully submitted that the claims contain limitations that patentably define over the references cited by the Examiner, for the reasons provided in the remarks above. Therefore, reconsideration and allowance of the pending claims is appropriate and respectfully requested.

Respectfully submitted,



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